

and therefore we obtain, from (1),

$$(2) \quad \begin{aligned} \psi - \psi_1 &= (g + \Gamma) \cot \epsilon \cdot t \\ &+ \left\{ \left( \nu + a (g' + \Gamma') \right) \cot \epsilon - \frac{1}{2} (g + \Gamma) (g' + \Gamma') - (g + \Gamma) (g' + \Gamma') \cot^2 \epsilon \right\} t^2, \end{aligned}$$

where (Leverrier, *loc. cit.*)

$$\begin{aligned} \eta \sin \Pi &= (g + \Gamma) t + r t^2, \\ \eta \cos \Pi &= (g' + \Gamma') t + r' t^2, \\ \psi &= a t + b t^2; \end{aligned}$$

and by substituting the numerical values, according to Leverrier (*loc. cit.*), we obtain from (2)

$$\begin{aligned} \psi - \psi_1 &= 0''.1356809 t - 0''.000221628 t^2, \\ \psi_1 &= 50''.23572 t + 0''.00011282 t^2. \end{aligned}$$

Instead of these values, Leverrier gives (*loc. cit.*)

$$\begin{aligned} \psi - \psi_1 &= 0''.13568 t - 0''.00022170 t^2, \\ \psi_1 &= 50''.23572 t + 0''.00011289 t^2; \end{aligned}$$

while the formula of Leverrier does not contain the term

$$- \frac{1}{2} (g + \Gamma) (g' + \Gamma') \cdot t^2.$$

Wilna Observatory,  
1876, Jan.

#### Note on the Satellites of Uranus. By E. Neison, Esq.

With the view of ascertaining whether the two outer satellites of *Uranus* were within the reach of a Newtonian reflector of  $9\frac{1}{3}$ -inch aperture, on the night of April 14, 8<sup>h</sup> 0<sup>m</sup> to 9<sup>h</sup> 15<sup>m</sup>, the telescope was turned on the planet. The air was very steady, and definition very good. After putting *Uranus* into the field of view, this was constricted to a diameter of about 2', and the neighbourhood of the planet carefully examined for faint stars. After a prolonged and very careful search two were picked up, the planet all the time being kept beyond the field of view. Whilst looking at the fainter of the two, which was only seen with difficulty, the planet accidentally sailed into the field, without however in any manner interfering with the distinctness of this very faint object. It was found to be sensibly as easy to pick up the two stars with the planet in the field as with the planet out.

The distance and position-angle of the two stars were estimated as well as possible, with the following result:—

A	Very faint and difficult	Distance 15-20"	Pos.-Angle 270°-280°
B	Fairly distinct	Distance 30-40"	Pos.-Angle 100-110°

On referring the next morning to the Ephemeris of Marth, it was found no satellite was in the position of the star B, but that A agreed well with the position of the III Satellite *Titania*, whose place was—

III Satellite, <i>Titania</i>	Distance 18"	Pos.-Angle 285°
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The next night, April 15, being also very clear and steady, *Uranus* was again examined with a field of 2' in an eyepiece magnifying 270, and, after a very careful search, three faint stars picked up.

C	Very faint	Distance 15-20"	Pos.-Angle 230°-240°
D	Slightly brighter than C	Distance 30-40"	Pos.-Angle 160-170°
B	Bright and distinct	Distance 50-60"	Pos.-Angle 100-110°

On the next morning it appeared that the two faint stars C and D agreed to some degree of approximation with the positions of the III and IV Satellites, whose places were—

III Satellite, <i>Titania</i>	Distance 24"	Pos.-Angle 223°
IV Satellite, <i>Oberon</i>	Distance 44"	Pos.-Angle 180°

The third star B was obviously the same star as that seen the previous night and marked B, the planet having moved about 20" further from it.

During the next week no night appeared to possess sufficient excellence of definition to render it worth while to turn the telescope on *Uranus*.

The 23rd of April turned out a fine, steady night, and from 8.30 to 9.15 the planet was examined. Two stars were picked up.

E	Very faint; only just visible	Distance 20-25"	Pos.-Angle 320°-330°
F	Only suspected	Distance 40-50"	Pos.-Angle 70-80°

Reference to Marth's Ephemeris next day showed that E agreed to a certain extent with the position of the IV Satellite *Oberon*, whose place was

IV Satellite, <i>Oberon</i>	Distance 33"	Pos.-Angle 338°
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The suspected star F, if it really existed, must have been a fixed star.

The night of April 25 was the finest night of the year, and no less than six stars were seen or suspected.

Z

		" "	° °
G	Very faint indeed; only suspected	Distance 35-40	Pos.-Angle 290-300
H	Comparatively distinct	Distance 60-80	Pos.-Angle 100-110
I	Faint, but fairly well visible	Distance 25-30	Pos.-Angle 250-260
B	Distinct and bright	Distance 120-140	Pos.-Angle 90-100
J	Very faint, and generally only glimpsed	Distance 20-25 or perhaps 30	Pos.-Angle 140-160
L	Large bright star, 3' or 4' off, that had been seen on the 23rd, and precedes <i>Uranus</i> .		

On the next day it was found that, according to the Ephemeris, I was the IV Satellite, probably *Oberon*, and J might have been the III Satellite *Titania*, the places being

III Satellite, <i>Titania</i>	Distance 32	Pos.-Angle 188
IV Satellite, <i>Oberon</i>	Distance 25	Pos.-Angle 253

The star B agreed in position with the star B seen on the nights of April 14 and 15.

Since April 25 moonlight has prevented further observations of the satellites or pseudo-satellites of *Uranus*.

On mapping down out of mere curiosity the places of the different stars seen around *Uranus*, on one plan, allowing for the motion of the planet, an entirely unforeseen result presented itself, when the stars seen on April 25 were inserted. For it was found that the star H seen on this night must have been on April 15 close to *Uranus*, its place being between Distances of 20"-30", and Position-Angles 180°-220°. Considering the difficulty of estimating the distances and position-angles of these faint stars, it is perfectly possible that what was taken for the IV Satellite of *Uranus* on April 15 may have been this star, which was close to the place of the Satellite. It also appeared that the star G, which was suspected on the night of the 15th must, if it really existed, have been not far distant from the star seen on the 23rd in the position of the IV Satellite *Oberon*. Its place must have been between Distances 22"-27", and Position-Angles 285°-300°. It is not however so likely as in the former instance, that this suspected star is what was seen, and taken for the Satellite of *Uranus*, since the position-angles differ considerably.

The point possesses, however, considerable interest, for it shows that a faint star being very approximately in the theoretical position of the satellite, is no proof that it actually is the satellite. The present observations show, however, that very probably the III Satellite *Titania* was seen on two occasions, and perhaps on a third; whilst the IV Satellite *Oberon* appears to have been seen for certain on one night, probably on another, and perhaps on a third.